SOME THEORETICAL AND PRACTICAL RESULTS OF INFLATION TARGETING

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CONCLUSIONS

The emergence of inflation targeting can be traced back to the 90's when first countries started forming a new policy strategy aimed at price stabilisation with „real" inflation targeters using explicit numerical targets and some applying a similar strategy with implicit determinations. The monetary policy framework has been endowed with rich theoretical and practical content but an interesting real question remains unanswered: how recent appliers can cope with a number of unaccomplished tasks in model-building and implementation. It is the most exciting challenge for transition economies how to reconcile institutional changes with real and nominal convergence. The solution of this issue provides an ample field for research and economic policy debates.

ABSTRACT

Monetary policy seeking an inflation target is an important issue of economic policy debates in our days. In my research I am going to focus on the evidences of applying this monetary regime in the European Union and in the transition countries. The inflation targeting system entails a comprehensive conception of economic policy tools. It has found application in various industrialized and emerging countries. The new classical economics and the neutrality of money theory of Lucas have raised many doubts concerning the effectiveness of monetary policy interventions. Since the first introduction of the new monetary policy approach based on inflation targeting numerous theoretical and empirical examinations have been carried out. Part of the research activity in this field aimed at comparing the effectiveness of curbing inflation of money targeting with inflation targeting or at classifying different practical versions of the regime. Some economists ventured upon confirming theoretical achievements with econometric analysis. In my present study I am intending to give a summary on the above findings, pointing at the difficulties of model-making and estimating empirical results.

INTRODUCTION

The development of a new monetary policy approach after the worldwide high inflationary periods of the 70's and the beginning of 80's was a logical shift in economic theory. *Lucas (1996)* and other new classical economists pointed at the difficulty of influencing economic actors' supply and demand decisions by any economic policy action reducing also monetary policy to a minimum role in affecting economic performance with little bearing on real variables in the

short run. Another theoretical debate evolved around the mid 80's, which focused on whether monetary policy following rules or applying discretion is more efficient in achieving its goals. Among others the article of *Barro and Gordon (1983)*[1] meant an important contribution to the discussion. In effect the inflation targeting monetary policy bears the characteristics of both, it entails a strong commitment to a mid-term inflation target but at the same time it includes many discretionary elements, therefore it can be regarded as a mixture of the two competing approach.

WHAT IS INFLATION TARGETING?

Frederic Mishkin himself – one of the first scientists who started establishing the theoretical framework of inflation targeting and emphasising its positive feature compared to other monetary regimes – in his early article on inflation targeting prepared in co-operation with Bernanke refers to this monetary policy strategy as a „*broad framework for policy*, which allows the central bank 'constrained discretion', rather than an ironclad policy rule in the Friedman sense."[2] Furthermore, he gives a compound conception about what attributes make a monetary regime inflation targeting: (1) the definition and announcement of medium-term numerical targets for inflation, (2) an institutional commitment to price stability as primary goal, (3) a monetary strategy built upon the inclusion of information drawn from a wide range of variables, not just monetary aggregates or the exchange rate, (4) a transparent monetary policy which is manifested in a regular communication of monetary policy objectives, instruments and decisions with the public and markets, (5) increased accountability of the central bank for making efforts to achieve its inflationary target. The monetary authority – according to this interpretation – announces a target level of inflation which allows for a gradual transition from the current to the desired steady state level of inflation to ensure price stability (usually a zero to two percent of annual rate of price change) in the economy. The question is whether inflation targets materially affect private sector expectations of inflation. The often raised criticism against any goal variable determining monetary strategy – such as an intermediate inflation goal - is that it is relatively unpredictable. *Lars E. O. Svensson (1997)*, *(2005)* speaks about *optimal inflation targeting* (further on IT) in that he regards the best possible intermediate target the current forecast of the goal variable itself. By defining an optimal monetary policy, he uses an explicit intertemporal loss function, and models the forecasting and decision process regarding the projections of the instrument rate and target variables.

His definition on inflation targeting comprehends:

(1) *An explicit monetary policy* objective in the form of a numerical inflation target, with an explicit concern not only about the stability of inflation but also about the stability of the real economy which is manifested in the choice of target variables (including both inflation and a real variable such as the output gap).

(2) *An internal decision process* – „forecast targeting" – where projections

[1] Barro, Robert and David, Gordon, „Rules, Discretion and Reputation in a Model of Monetary Policy", Journal of Monetary Economics, July 1983, 12.

[2] Ben S. Bernanke-Frederic Mishkin (1997): Inflation targeting: a new policy framework for monetary policy? Abstract. Working Paper 5893. National Bureau of Economic Research, Cambridge.

of the target variables play a prominent role and the central bank sets the instrument rate so that the forecast of the target variables is relatively close to the monetary-policy objective.

(3) *A very high degree of transparency and accountability,* where the central bank typically announces internal projections and makes a strong commitment while the detailed external scrutiny of the bank's performance is resolved.

He recommends the improvement on all the three points of his definition – that is what he aims at by using mathematical models – and names *flexible inflation targeters* those, who try to meet the inflation target by stabilising the real economy (keeping e.g. a stable output gap). He supports those policy-makers which make forecasts for an entire instrument-rate path and corresponding projections on target variables by influencing private sector expectations on a longer horizon. In setting up models for maximising central bank utility he presumes that certainty equivalence holds (the combination of linear models and quadratic loss functions imply this precondition): For addressing a possible ambiguity of a non-adequate specification of a medium-term objective and lack of transparency, Svensson recommends to use an explicit loss function as the operational objective of the central bank. The possible way of stating such a function can be given in the following manner:

$L_t \equiv (\pi_t - \pi^*)^2 + \lambda x_t^2$, where the first part of the equation shows the loss deriving from the difference between the optimal and the up-to-date rate of inflation and the second part stands for the deviation of real variables from their optimal value (e.g. the output gap) multiplied by the relative weight (λ) of stabilisation efforts comparing to inflation stabilisation attempts, which can be best chosen by a voting procedure of the decision-makers of the monetary authority. (Instrument-rate changes and exchange rate changes can also be included in this function as target variables.) The explicit intertemporal loss function is then a sum of current and expected future losses and takes the form:

$E_t \sum_{\tau=0}^{\infty} \delta^\tau L_{t+\tau,t}$, where δ is a discount factor expressing the time preferences of the central bank.

If there are different projections made at present on future instrument levels, the central bank should choose the instrument-rate plan that results in the inflation and output-gap projection with the lowest loss. In sum, the explicit loss function states the target variables, and the intra- and intertemporal substitution between them. For instrument-rate assumptions there are different methods which help drawing up projections (the use of a constant instrument rate/CIR/, the market expectations of future instrument rates /ME/ or the Taylor-type rule). As certainty equivalence does not always hold (when uncertainty is multiplicative and not additive) mean target projections – like previously introduced – have to be replaced by (probability) distribution forecast targeting.

STRUCTURAL MODELS FOR FORECASTING INFLATION

The models used by central banks to forecast inflations have a lot of elements in common: (1) they include an open economy demand curve, (2) a Phillips-curve relationship, (3) an international asset market equilibrium condition and (4) a monetary reaction function. Macro-econometric models having been aimed at empirically investigating IT systems and main macro-econometric

models of leading central banks – such as the Bank of Canada and the U.S Federal Reserve use these elements as starting point to produce forecasts. In nowadays' global economy two of the triad of the world's leading economic forces: Japan and the US does not have an explicit inflation targeting strategy notwithstanding the European Central Bank with its 0-2% annual explicit inflation rule. To understand, however, how such a model projecting inflation and other real variables behaves in practice a good example is provided by *Richard Dennis (2005)*, who compared the inflationary path of the US economy without an explicit inflation target with the imaginary situation of the same applying an explicit target for the period over a 25 years' period (1980-2005). He uses a small-scale dynamic New-Keynesian model of the business cycle with sticky prices by addressing the issues of time inconsistency through considering the possibilities of the central bank exerting a policy of both commitment and discretion. In the simple macroeconomic model firms in the output market are monopolistically competitive and hire workers in a perfectly competitive labour market. The price rigidity assumption is supported by a Calvo pricing scheme, where in each period a proportion of firms (1-ξ) is able to reoptimize its price-forming. Taking the pricing assumptions mentioned so far and using the subjective discount factor β the Phillips-curve –equation is stated as follows:

(1)

$$\pi_t = \frac{1}{1+\beta}\pi_{t-1} + \frac{\beta}{1+\beta}E_t\pi_{t+1} + \frac{(1-\beta\xi)(1-\xi)}{(1+\beta)\xi}\hat{mc}_t$$

where $\hat{mc}_t$ denotes real marginal costs.

The demand side is represented by an infinitely living household spending their income on consumption (C_t), habit consumption (H_t), leisure (1-L_t) and real money balances ($\frac{M_t}{P_t}$).

(2)

$$U = E_t\sum_{t=0}^{\infty}\beta^t u(C_{t+1}, H_{t+1}, L_{t+1}, \frac{M_{t+1}}{P_{t+1}})$$

The household's – being the only beneficiary of the lump-sum dividend payment (Π_t)- faces the following budget constraint:

(3)

$$C_t + \frac{M_t}{P_t} + \frac{B_t}{P_t} = \frac{W_t}{P_t}L_t + \frac{(1+R_{t-1})}{P_t}B_{t-1} + \frac{M_{t-1}}{P_t} + \frac{\Pi_t}{P_t},$$

where B_t denotes nominal bond stock, R_t the nominal interest rate, and W_t the nominal wage rate.

To estimate parameters Dennis uses a Taylor-type rule describing the nominal interest rate path:

(4)

$$R_t = (1-\phi_3)[\phi_0 + \phi_1 E_t\pi_{t+1} + \phi_2\hat{c}_{t-1}] + \phi_3 R_{t-1} + \varepsilon_t,$$

where parameters ϕ_1 and ϕ_2 symbolise the response parameters of the central bank to movements in expected inflation and consumption gap, while ϕ_3 captures the monetary policy gradualism. To characterise the way monetary policy is to be optimised he uses a loss function minimizing the deviation of inflation from its target level, consumption gap and the change in the nominal interest rate:

(5)

$$\text{Loss} = E_0\sum_{t=0}^{\infty}\beta^t\left[(\pi_t - \pi^*)^2 + \lambda\hat{c}_t^2 + \nu(R_t - R_{t-1})^2\right]$$

where all parameters are communicated to the public (including of course the inflation target π^*.

Through calibrating the model with inflation targeting Dennis compared the economic outcome under explicit inflation target with actual data of the 25 years' period under examination (both

under commitment and discretion). The two time series showed negligible difference with the estimated data once lagging behind (relatively strongly in the 80's), once surpassing the actual values. The result would lead us to make conclusions on inflation targeting as a policy strategy nothing more effective than others though the US Fed have strongly committed itself to an implicit inflation target throughout the last decades, which is de facto very similar to inflation targeting (*Mishkin, 1997*) and based on a well – defined implicit target as shown by *Daniel Leigh (2005)* in his research applying a modified *Taylor-rule* with varying inflation and natural interest rate objective:

$$i^*_t = r^n_t + \pi^e_t + (\beta - 1)(\pi^e_t - \pi^*_t) + \gamma y_t,$$

where i^* is the target level of nominal interest rate (here: federal funds rate), π^e_t is expected inflation (inflation forecast), y_t is the output gap, r^n is the natural rate of real interest and π^* is the inflation target.

The scope of the present paper does not allow listing all the numberless models and model building possibilities for different types of economies – even those applying explicit inflation targets and fully complying with the prerequisites of the monetary policy regime under examination - with different degrees of openness, output, inflation, interest rate and exchange rate volatility and various qualitative variables. On the whole, these mathematical formulas serve the fulfilment of the rationale of inflation targeting: *the achievement of a greater stability of output and employment in the short-run while ensuring price stability in the long-run through well-anchored expectations*. Researchers and experts have not found a common ground about what IT means in terms of implementable policy rule. Taylor-rule or other policy rules with long-run fixed inflation targets or the solution of a central bank optimisation problem in a rational expectation model is how an IT is often identified. For small, open economies and transition countries – such as Hungary – a model with imperfect knowledge is advisable where „private agents attempt to infer the central bank's goals and reactions through past actions" (*Williams, 2006*). Suggestions towards these countries (e.g.: *Mishkin, 2003*) have touched upon that these countries include a focus on limiting exchange rate fluctuations in their inflation targeting regime which should also appear in the central bank's loss function.

EMPIRICAL EVIDENCE

Some authors, despite the results of comparisons between explicit and implicit rules in the USA, take a stand for inflation targeting as the best monetary policy approach. Some empirical investigations carried out – among others – by *Hu (2003)* and *Wu (2004)* encompassing a large number of industrialised, transition and emerging countries have proved that inflation targeting is a more successful monetary policy strategy than others in both real and inflation stabilisation. Previous econometric analyses attached the positive disinflationary tendencies evolving in all OECD countries in the last 20 years to an overall „generic regression to mean" and failed to confirm the superiority of the IT regime over other strategies geared at price stability (*Neumann – von Hagen, 2002; Ball – Sheridan, 2003).* These studies, however, relied on a very small sample and a short time-scale. The research of *Yifan Hu* spread over a group of 66 countries, among which he distinguished inflation

targeters (22) and potential inflation targeters (44), and covered a twenty–year period (1980-2000). For the clear delimitation of countries with an IT regime from those following another approach he took advantage of the classification of *Truman (2003)* to characterise countries belonging to inflation targeters: (1) adopting price stability, (2) articulating a numerical target or a sequence of targets, (3) establishing a time horizon to reach the target, and (4) creating an evaluation system to review whether the target has been met. Hu applied 22 variables, of which 9 expressed economic conditions/performance, 8 examined the economic structure and three the quality of economic institutions. Countries with utmost initial inflation rates and less than five year experience of application were dropped from the sample. Through the evaluation of descriptive statistics Hu found a positive relationship between inflation and output variability and thus came to a result contradicting the Taylor-rule presuming a trade-off between the two variable and proved that the IT regime has a positive impact on economic performance, on output growth. Furthermore, the examination confirmed that countries having stabilised the annual level of price increase are more in favour of the application, which again underpins the assumption that inflation targeting does play an important role in lowering the level of inflation and increasing its predictability as some authors *(e.g. Johnson, 2002; Mishkin – Schmidt-Hebbel, 2001)* stated previously.

Thomas Y. Wu examined 22 OECD industrial countries over a 27 years' horizon and investigated the character of their monetary regime with special regard to interest rate policy and the behaviour of the inflation rate throughout this period. The rationale behind this approach is that real interest rate is a channel in the transmission mechanism through which the short run nominal interest rate set by the monetary authority affects the inflation rate. Data were analysed in a multi-period differences-in-differences framework as the starting date of adopting inflation targeting varies across the 8 countries of the „treatment group" (among with the revolutionist – New Zealand - as first applier in 1990 to the last – Switzerland – in 2000). The examination revealed two important findings: (1) countries adopting the IT regime have experienced significant gains from a higher than average decrease in their average inflation rates, (2) this favourable result can not simply be attributed to an „aggressive interest rate" policy as these countries can not be characterised with a strong rise in their real interest rate levels. The empirical research carried out to estimate the efficiency of inflation targeting has hence yielded very interesting, significant but sometimes contradictory results which need further investigation. The reason why it is too early to draw final consequences is the short period of time with comparable data and the diverse economic and institutional characteristics of countries that have been or should from now on be submitted to examination.

RESULTS AND DISCUSSION

Through the effective gearing of inflation and positive impact of real performance of the economies and with a successful history of 25 years from the first application inflation targeting still raises many issues to be addressed. As the range of inflation targeters includes both emerging countries with high starting inflation rates to industrialised countries with relative initial price stability, different policy rules and modelling procedures should be applied both for theo-

retical investigations and during practical usage. Among a great number of questions still unsolved some considering instrumental problems (absence of other nominal anchor, the influence of fiscal stance, the influence of the exchange rate mechanism on price stability and its role in the transmission process, the choice of the target variable, the target width and horizon etc.) and others institutional attributes (overall transparency, accountability of the central bank, the potential application of escape clauses, institutional independence etc.) countries with little experience have a lot to work on refining or redefining their strategy. Especially transition countries are facing a dilemma, how to conduct an independent monetary policy with an IT regime before losing partial independence on the threshold of joining the EMU? Are there country-specific rules for these economies or should they follow suit with advanced economies? Does inflation targeting leave enough room for manoeuvre also in the case of potential external shocks and exchange rate fluctuations? How can the objectives of price stability and enhancing economic performance be best harmonised?

REFERENCES

(1) Bernanke, Ben S. – Mishkin, Frederic (1997): Inflation targeting: a new policy framework for monetary policy? Working Paper 5893. National Bureau of Economic Research, Cambridge – (2) Carare, Alina – Schaechter, Andrea – Stone, Mark – Zelmer, Mark (2002): Establishing Initial Conditions in Support of Inflation Targeting. IMF Working Paper – (3) Dennis, Richard (2005): Inflation Targeting under Commitment and Discretion. FRBSF Economic Review – (4) Hu, Yifan (2003): Empirical Investigations of Inflation Targeting. Institute for International Economics – (5) Jankovics, László (2005): Inflációs célkitűzés rendszere: az első másfél évtized tanulságai. Külgazdaság. XLIX. évf. 2005/10. pp.4-25. – (6) Jonas, Jiri – Mishkin, Frederic S. (2003): Inflation Targeting in Transition Countries: Experience and Prospects. Working Paper 9667. National Bureau of Economic Research, Cambridge – (7) Leigh, Daniel (2005): Estimating the Implicit Inflation Target: An Application to U.S. Monetary Policy. IMF Working Paper – (8) Mishkin, Frederic S. - Schmidt-Hebbel, Klaus (2001): One decade of inflation targeting in the World: What do we know and what do we need to know? Working Paper 8397. National Bureau of Economic Research, Cambridge – (9) Orphanides, Athanasios – Williams, John C. (2006): Inflation Targeting under Imperfect Knowledge. Working Paper 2006-14. Federal Reserve Bank of San Francisco – (10) Svensson, Lars E.O. (2005): Optimal Inflation Targeting: Further Developments of Inflation Targeting. Prepared for the Central Bank of Chile Conference on „Monetary Policy under Inflation Targeting", Santiago – (11) Wu, Thomas Y. (2004): Does Inflation Targeting Reduce inflation? An Analysis for the OECD Industrial Countries. Banco Central do Brasil